Manual Pressure verses Shot Blocker in Reducing Intramuscular Injection-Related Pain: A Comparative Randomized Controlled Trial

Safaa Ezzat AL-Shammiry, MSN* Sadeq AL-Fayyadh**

ABSTRACT

Background: Patients are unable to continue their planned management line because of a severe fear of the pain that is associated with intramuscular (IM) injection. Nurses have a moral and legal obligation to employ modern IM injection techniques to enhance the patient's experience. Non-pharmacological therapeutic alternatives, are used in pain management today, which can be executed without additional cost or time in clinical practice arena.

Aim: This study was conducted in order to compare the effect of shot blocker and manual pressure on reducing intramuscular (IM) injection-related pain in adults patients.

Methods: A prospective, comparative, randomized controlled trial (RCT). The study was conducted on 192 adults patients who received Diclofenac Sodium injections in Emergency Departments (EDs). The patients were randomized into 3 groups: ShotBlocker group (n=64), manual pressure group (n=64), and control group (n=64). Immediately after the injection the patients were asked to evaluated their level of pain. The Visual Analog Scale (VAS) was used to measure pain intensity.

Results: There are statistically significant differences in pain scores among the different groups being compared ($p < .001$). The shot blocker group had significantly lower pain scores compared to the manual pressure group (mean difference of -1.10938, $p < .001$) and significantly lower pain scores compared to the control group (mean difference of -3.17188, $p < .001$). The manual pressure group had significantly higher pain scores compared to the shot blocker group (mean difference of 1.10938, $p < .001$) and significantly lower pain scores compared to the control group (mean difference of -2.06250, $p < .001$). The control group had significantly higher pain scores compared to the manual pressure group (mean difference of 2.06250, $p < .001$) and significantly higher pain scores compared to the shot blocker group (mean difference of 3.17188, $p < .001$).

Conclusion: Shot Blocker and manual pressure applications were found to be effective in reducing pain levels in patients compared to the control group. While the Shot Blocker was found to be more effective in reducing pain levels when compared to the control and manual pressure groups. Therefore, ShotBlocker is recommend as an effective non-pharmacological method to reduce pain related intramuscular injection.

Keywords: Intramuscular Injection; Pain Management; Shot Blocker; Manual Pressure.

INTRODUCTION

Development is constantly happening in various fields worldwide, especially in healthcare[1]. Healthcare providers have a crucial responsibility in administering drugs, and this requires extensive knowledge and skills. Medication can be administered through various routes, including oral, topical, and parenteral methods[2,3]. Intramuscular (IM) injection is frequently used for medications with severe and irritating qualities, as well as when a faster impact than subcutaneous tissue is needed[4]. IM injections have numerous applications and are frequently utilized, with an estimated 16 million IM injections administered worldwide each year[5]. Immunization accounts for 5% of these injections, while 90% are used for therapy[6,7].

Medications that may cause tissue irritation, and a greater volume of medication can be administered by using intramuscular injection[8,9,10]. When IM injections are not given correctly, they can result in a variety of problems, including muscle fibrosis, contracture, granuloma, hematoma, abscesses, pain, cellulitis, nerve damage, and tissue necrosis[11]. Of equal importance, IM injections can cause anxiety and needle phobia[12,13]. Studies indicate that only 32% to 52% of IM injections are successful, and patients who receive the remaining unsuccessful injection may experience physical and emotional adverse effects[14,15]. The most frequent of these side effects is pain, which can come from improper site selection, poor skin penetration by the injector, and the mechanical and chemical effects of the drug, both during and after injection[16,7].

Pain is a complex and multifaceted phenomenon that causes unpleasant sensory and emotional sensations as a result of actual or prospective tissue injury[17,18]. The American Pain Association has designated pain management as the fifth vital sign[19,20]. Mechanical stress and a fast rise in pressure caused by the entry of the needle and absorption of the chemicals immediately into the muscle may cause intramuscular injection-related pain[21,7]. Factors such as the type and dosage of the medication given, administration method, patient anxiety, body position, injection speed, needle placement, and length, all can contribute to increased pain during intramuscular injection[22].

Intramuscular (IM) injection, is one of the most important reasons for pain; hence, applying the best strategy to pain management is the major duty of nurses[23,24]. Nurses play a crucial role in evaluating

* Wasit Health Directorate, Ministry of Health
Wasit, Iraq.
Email: safaa.ezzat2102m@conursing.uobaghdad.edu.iq
** Adult Nursing Department
College of Nursing, University of Baghdad, Baghdad, Iraq.

patients' pain and offering suitable pain management options. As a result, they have the potential to reduce the number of individuals who suffer from pain and the inadequate treatment of pain[25,26]. Nurses are in charge of managing pain during injections or treating the patient using the methods they use for medication administration. To maintain positive patient-nurse relationships, nurses should provide high-standard patient care, to increase patient satisfaction[27,12]. Nurses must ongoing evaluate their patients, select the most suitable evidence-based intervention, apply it to the patient, and monitor the results[28,29,30]. Proper pain management not only minimizes physical discomfort, but also enhances overall quality of life[31].

In recent years, there has been a growing awareness of the need to manage injection-related pain and discomfort. Non-pharmacological therapeutic alternatives, in addition to pharmacological therapies, are used in pain management today[32]. Pharmaceutical interventions, such as intramuscular or topical anesthetics, can minimizing IM injection-related pain. Due to the poor and gradual analgesic effects, danger of systemic toxicity, local adverse effects and increased costs, the use of topical anesthetics in the emergency department (ED) is limited[33]. Non-pharmacological interventions that have been demonstrated to reduce acute pain, have the ability to alleviate discomfort while having no influence on the procedure's time or cost [34]. Cold application, manual pressure, acupressure, vibration, Z track method, air-lock technique, Buzzy, and ShotBlocker are the most often utilized physical approaches to alleviate IM injection-induced pain[35,36,33,22,12].

The non-pharmacological techniques are used, to alleviate IM injection-related pain. One of the newly introduced non-pharmacological approaches is a plastic device known as the Shot Blocker[37,38]. The ShotBlocker is a patented device created by (Bionix®, OH, United States) designed to alleviate the pain caused by injection. This innovative tool can be utilized for intramuscular and subcutaneous injection and is suitable for individuals of all ages. Unlike conventional medication administration aids, ShotBlocker is a skin-contacting device with thick, blunt points and a hole in the center that is positioned over the injection site. The pointed surface is placed on the administration area, and the blunt points offer physical stimulation that may assist in pain management. Shot Blocker does not have any negative side effects and is not considered a medication[38,40].

The use of manual pressure has been demonstrated to decrease pain perception in people who have undergone injections. According to the gate control theory, manual pressure application, like other treatment procedures, lessens pain perception[41]. Further research in children and adults is needed before the manual pressure technique may be used in daily clinical practice[42]. Both abovementioned non-pharmacological interventions, which nurses may utilize to reduce pain during injections, can be implemented in clinical settings with no additional expense or time lost[43]. Despite these options being available, nurses have not yet adopted methods that can effectively alleviate injection pain[44].

When the literature is evaluated, it is clear that research on this issue is largely centered on pediatric groups or during vaccination or intravenous procedures in children. Because it is recognized that the pain experienced by adults differs from the pain experienced by children, there is a need for substantial research on these concerns to be undertaken with adult groups as well[45,46,47,35]. However, in adults' population, the conducted studies are less and inconclusive[39,37]. While some studies have shown that manual pressure is useful in minimizing injection pain[48,49,34]. However, there is no research's indicating which of these non-pharmacologic is more efficient in decreasing intramuscular pain. Conducting such a study will be beneficial and supportive for health care providers in reducing adult people's pain and fears from using intramuscular injections. It also opened the way for researchers to carry out other similar studies. Therefore,

This randomized control trial aimed to answer the following research question: Does the shot blocker or manual pressure more effective in reducing pain associated with intramuscular injection in adults, when injecting Diclofenac Sodium?

MATERIALS and METHODS

Research Design: This study was a prospective, comparative, randomized controlled trial (RCT), using single-blind technique.

Setting and Samples: This study was conducted during the period of December 14th, 2022 to February 14th, 2023 on adult patients who were admitted to the emergency hospitals in Al-Azizia General Hospital and Al-Numaniyah General Hospital in Wasit, Iraq. There have been (192) patients in the Sample. The sample size was calculated according to A-priori sample sizes for student t-tests, as presented in table (1). Both the intervention groups and the control group obtained an equal number of these subjects as shown in Study Protocol Algorithm Section Figure (1).

Participants: The criteria used for inclusion in the study were as follows: Adult patients aged (18-70) years old; voluntary participated in the study; did not receive analgesics/sedatives during the past 24 hours; have no problems communicating and are fully conscious; patients who entered the Emergency Department and were prescribed analgesics by the in-charge physician(s). The criteria used for exclusion in the study were as follows: Patients who refused to participate in the study; patients who have problems communicating and unconscious; those who have fibrosis, wound or infection in the injection site; patients who have had Road Traffic Accidents (RTA), stab wounds or any type of bleeding injury; patients who continue to take medication (Antibiotics, Analgesics) through a vein or muscle; pregnant women; and patients suffering from side effects of Diclofenac Sodium such as Gastric Ulcers and Asthma.

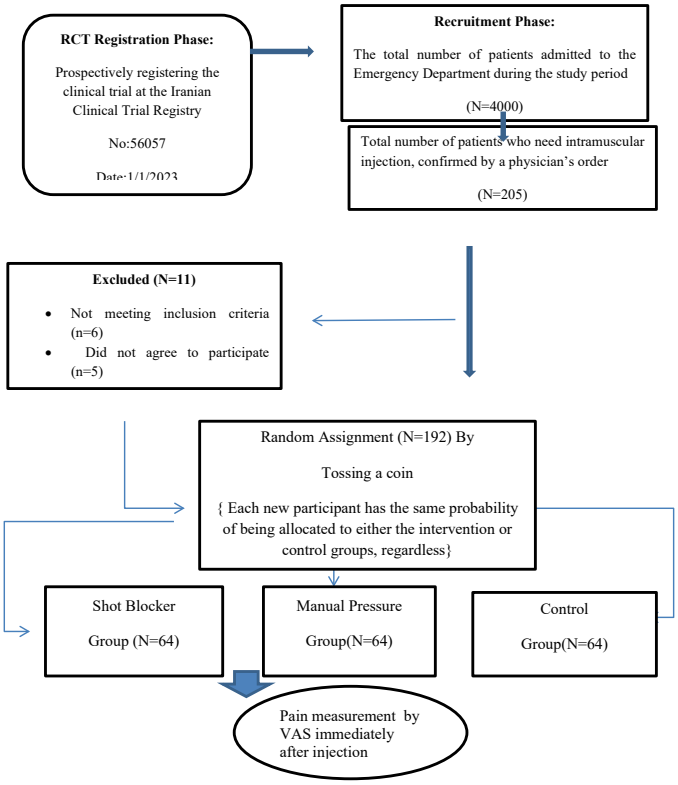

Figure 1: Study Protocol Algorithm

Table 1: Minimum Sample Size Determination

Parameter of calculation the minimum sample size	Selected Values
Anticipated effect size (Cohen's d):	0.5
Desired statistical power level:	0.8
Probability level:	0.05

*Minimum total sample size (one-tailed hypothesis): 102
*Minimum sample size per group (one-tailed hypothesis): 51
*Minimum total sample size (two-tailed hypothesis): 128
*Minimum sample size per group (two-tailed hypothesis): 64

DATA COLLECTION TOOLS

Demographic and Lifestyle Data of Patients: The demographic data section was designed to obtain the essential descriptive data of the participants in the study. These data included (Age, Gender, Residence, Monthly Income, Occupation, Academic Level of Education), and lifestyle data included (Fear of IM Injection).

Visual Analogue Scale (VAS): This scale is used to indicate the level of subjects' pain on the 10 cm-long scale, which has a left and right end for "no pain" and "severe pain," respectively[42]. There are four levels of pain severity: none (0 points), mild (1-3 points), moderate (4-6 points), and severe (7- 10 points)[50]. The Visual Analogue Scale (VAS) is a commonly used measurement tool both nationally and internationally. Scientific evidence has shown that VAS is a reliable and valid scale for individuals who are 18 years old and above[51,52].

Intervention(s): The study included adult patients who were chosen based on the aforementioned criteria. The study was carried out in the Emergency Departments with patients who had been prescribed (diclofenac sodium) by their physician(s). To reassure the participants, the researcher explained the study's aims, duration, and technique in terms of information confidentiality. Following that, the oral and written consents of the patients who will participate in the sample were obtained, as they were randomly divided into three groups (Total 192), tossing a coin method was chosen (i.e., heads - control, tails - intervention) to ensure randomization and non-bias: the control group (N=64), the shot blocker group (N=64), and the manual pressure group (N=64). The injection procedure and the randomization method for selecting one of the groups are discussed with participations. The researcher introduced the patients to the Visual Analog Scale (VAS) pain intensity scale before administering the injection, placing a check in front of the number denoting the degree of the pain. For many years, healthcare providers preferred the Dorsogluteal (DG) region of the buttocks for IM injection. Kilic et al. 2014 were shows that the majority of nurses (81.5%) option for the DG region when administering intramuscular injection[3]. An emergency female nurse was trained to give intramuscular injection to women group, whereas the researcher deliver injection to males group. The data collection method is described in the following phases.

Interventional Procedure: First, preparing an ampoule of Diclofenac Sodium before injection procedure: It comes in the form of a 75 mg/ 3 ml solution. To prepare it, researcher(s) need a 5 cc syringe, a 70 mm (.027 Inch) needle, 22 gage. A prone position with the toes pointed outward was ideal subject position for the IM injection. To assess the existence of fibrosis or damaged area, palpating the Dorsogluteal region with the fingertips of the hand was performed with every subject. The standard IM injection application method was used for all groups (Table 2). The following products were prepared for medication administration:

A. Alcohol-based disinfectant
B. Sterile cotton/ Sterile gloves
C. Shotblocker
D. Diclofenac Sodium Ampoule
E. Syringe (5cc syringe and 70 mm (.027 inch) needle, 22 G)
F. Medical waste/ sharp objective container

Table 2: Protocol of Intramuscular Injection

Medication	Diclofenac Sodium75 mg/ 3
Injection Site	Dorso-gluteal muscle
Injection Volume	3 ml
Needle Size	22 gage, 70 mm (.027 IN)
Injection Site Cleaning	70% ethyl alcohol
Time of Injection Procedure	15 seconds
Injection Angle	90 degrees

ShotBlocker Group: It is a plastic instrument in the shape of a C with a blunt protrusion contacting the skin on one side. ShotBlocker protruding surface is maintained in place during injection by pushing against the skin; the injection is carried out through the opening[53,54,39]. In addition to the IM injection standard process steps, the protruding section of the ShotBlocker was placed in contact with the skin in the group of patients after cleaning the skin. The ShotBlocker was firmly pushed against the skin, and the injection was conducted immediately with the dominant hand after the device was firmly pressed against the skin of the patient with the operator non-dominant hand, and the injection was made through the central opening. The ShotBlocker was withdrawn from the skin once the injection was completed, then it can be sterilized and used for other patients.

Manual Pressure Group: This manually applied pressure was applied prior to injection. The researcher applied pressure to the injection site for 10 seconds with the thumb of the passive hand, applying pressure strong enough to feel resistance. After wiping the region with an alcohol swab and letting it dry, an injection was administered [55,48].

With this group, according to the injection procedure protocol, the researchers used thumb and forefinger of non-dominant hand to provide pressure for 10 seconds prior to the injection process. After sterilizing the region with an alcohol solution, the injection was conducted at a 90-degree angle.

Control Group: Standard intramuscular injection techniques were employed with this group using the same preparations expects for shotblocker and manual pressure without any intervention, including (22-gauge, 70 mm (.027 inch)). And a 5 mL syringe for drug administration. Stretching the skin taut while holding the syringe like a pencil or dart, place the needle at the injection site at a 90-degree angle to the skin. The medication was administered within 15 seconds (sec).

After the injection process, all subjects were given a questionnaire to rate their pain level, using Visual Analog Scale (VAS), with (0) being no pain and (10) representing severe pain. The patients were asked to assess the pain caused by the intramuscular injection by placing a sign in front of the number indicating the pain. Patients estimate their own pain.

Data Analysis: Descriptive statistics: Used to describe the demographic data and pain levels for (manual pressure, Shotblocker, and control groups). Analysis of Variance (ANOVA) was used to measure the difference in the pain scores among all groups (manual pressure, Shotblocker, and control groups). Fisher Exact Test, as a Nonparametric test of association was used to determine the statistical relationship between pain levels and demographic variables, for all groups (manual pressure, Shotblocker, and control groups. The

Statistical Package for the Social Sciences (SPSS) version 24, was used for statistical analysis of the collected data. In which descriptive and inferential statistical measures were employed.

Ethical Considerations: This research was confirmed by the Committee of Scientific Research at the College of Nursing, University of Baghdad on December,4th,2022. After obtaining the approval of the Ministry of Planning (Central Statistical Organization) on December 6th ,2022, the official approvals were taken to start work from the Wasit Health Department. And then approval of the targeted hospitals were granted on December 14th ,2022 to collect the samples. The patients were informed that participation on the study is completely voluntary and would have no financial or legal consequences, and that the information will be kept an absolute privacy.

Clinical Registry: As an essential step of original RCT, an approval was obtained for the registration of the trial protocol in the Iranian Registry of Clinical Trials (IRCT) on January 1st, 2023. The registration reference is IRCT20220929056057N1.

RESULTS

Table 1: Descriptive Statistics of Socio Demographic and Lifestyle Data

Characteristic	ShotBlocker Group (n=64) N (%)	Manual pressure Group (n=64) N (%)	Control Group (n=64) N (%)
Age Groups/ Years			
18- 24	22 **(34.4%)**	21 **(32.8%)**	26 **(40.6%)**
25- 31	20 (31.3%)	17 (26.6%)	18 (28.1%)
32 – 38	11 (17.2%)	10 (15.6%)	4 (6.3%)
39 – 45	5 (7.8%)	8 (12.5%)	7 (10.9%)
46 – 52	4 (6.3%)	3 (4.7%)	5 (7.8%)
≥53 years old	2 (3.1%)	5 (7.7%)	4 (6.3%)
Gender			
Male	39 **(60.9%)**	39 **(60.9%)**	38 **(59.4%)**
Female	25 (39.1%)	25 (39.1%)	26 (40.6%)
Occupation			
Employed	18 (28.1%)	24 **(37.5%)**	20 (31.3%)
Earner	25 **(39.1%)**	21 (32.8%)	22 **(34.4%)**
Housewife	5 (7.8%)	10 (15.6%)	12 (18.8%)
Free Jobs	16 (25.0%)	9 (14.1%)	10 (15.6%)
Levels of Education			
Does Not Read or Write	5 (7.8%)	6 (9.4%)	11 (17.2%)
Read and Write	10 (15.6%)	10 (15.6%)	8 (12.5%)
Primary Education			
Intermediate	13 (20.3%)	13 **(20.3%)**	7 (10.9%)
School	12 (18.8%)	11 (17.2%)	13 **(20.3%)**
High School	5 (7.8%)	8 (12.5%)	13 **(20.3%)**
Bachelor Degree	18 **(28.1%)**	11 (17.2%)	10 (15.6%)
Postgraduate	1 (1.6%)	5 (7.8%)	2 (3.1%)
Fear of IM Injection			
No Fear	41 **(64.1%)**	38 **(59.4%)**	21 (32.8%)
Some Fear	13 (20.3%)	11 (17.2%)	31 **(48.4%)**
Have Fear	10 (15.6%)	15 (23.4%)	12 (18.8%)

Table1, shows some descriptive characteristics of the patients who participated in the study. In the current research regarding the age group variable, the results showed that (34.4%) of the shotblocker group, (32.8%) of the manual pressure group and (40.6%) of the control group were between age (18-24) years old. Of equal importance, (60.9%) of the participants in the Shotblocker group, (60.9%) in the manual pressure group and (49.4%) in the control group, were males. Regarding subjects' occupational status, (39.1%) of the shotblocker group were earners, (37.5%) of the manual pressure group were employed, and (34.4%) of the control group were earners. Relative to the educational level, the more than a quarter (28.1%) have bachelor degree in the Shotblocker group, (20.3%) in the manual pressure group, have completed primary education. Similarly, (20.3%) have intermediate school education, and (20.3%) have high school education in the control group. Finally, when subjects were asked about fear of IM injection, (64.1%) in shotblocker group, (59.4%) in the manual pressure group report no fear of IM injection. In contrast, almost half (48.4%) of participants have some fear of injection in the control group.

Table 2: Descriptive Statistics of The Reported Measured Pain Levels by Using Visual Analogue Scale (VAS)

Pain Levels (VAS) Scale	ShotBlocker Group(n=64) N (%)	Manual pressure Group (n=64) N (%)	Control Group (n=64) N (%)
No Pain	21 (32.8%)	35 **(54.7%)**	3 (4.7%)
Mild Pain	41 **(64.1%)**	8 (12.5%)	28 **(43.8%)**
Moderate Pain	23 (35.9%)		26 (40.6%)
Severe Pain			7 (10.9%)

In table 2, the descriptive statistics of pain levels by using visual analogue scale (VAS) showed that, in the shot blocker group (64.1%) reported no pain after receiving the application, in the manual pressure group (54.7%) reported mild pain after receiving the application, and in the control group (43.8%) reported mild pain after receiving standard application.

Table 3: Statistical Relationship Between Pain Levels Score and Study Variable

Study Groups	Fisher's Exact Test Value	P. Value
ShotBlocker Group		
Age Groups	5.837	.305
Gender	0	1.000
Fear of IM Injection	1.120	0.694
Manual pressure Group		
Age Groups	8.658	.743
Gender	2.905	.211
Fear of IM Injection	8.080	.068
Control Group		
Age Groups	23.839	.068
Gender	9.196	.017
Fear of IM Injection	13.658	.014

Table 3, demonstrated the statistical association between pain levels score using VAS and study variable in all groups. The Fisher Exact Test showed that there is no statistically significant association between pain intensity and patients age group, in the shot blocker group (X^2=5.837, P= 0.305), in manual pressure group (X^2=8.658, P= 0.743), and control group (X^2=23.839, P= 0.068). Concerning the patients' gender there is no statistically significant association between pain intensity and a patient's gender in the Shotblocker group (X^2=0, P= 1.000), in manual

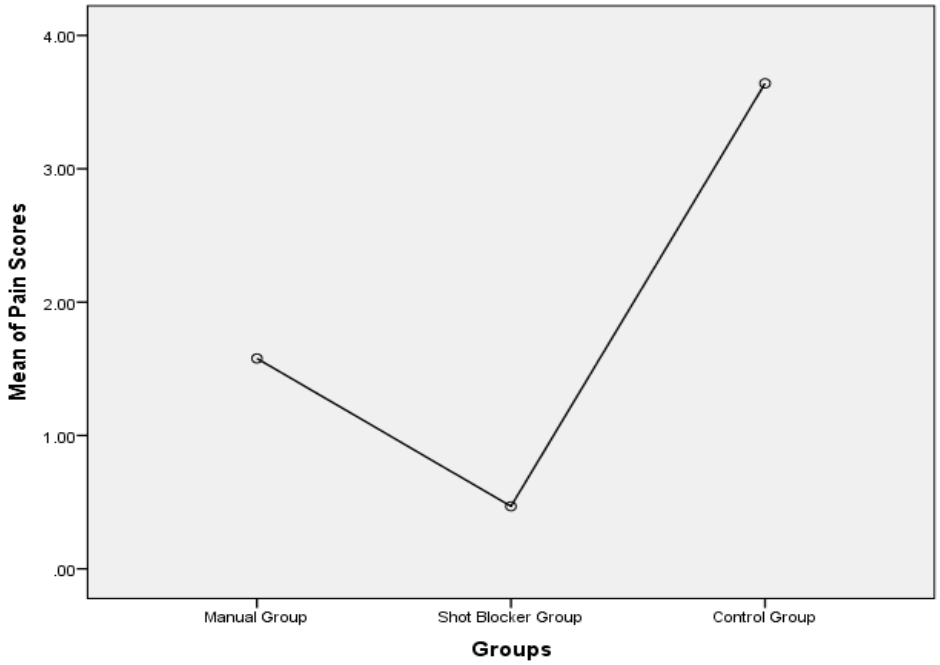

Figure 2: The mean plot demonstrates the highest pain scores was spotted in the control group, while the pain scores appeared lower in the Shotblocker group. However, the manual pressure group demonstrated mild pain score.

pressure group (X^2=2.905, P= 0.211), and control group (X^2=23.839, P= 0.068). Lastly, that there is no statistically significant association between pain intensity and fear of IM injection in the shot blocker group (X^2=1.120, P= 0.694), in manual pressure group (X^2=8.080, P= 0.068), and control group (X^2=13.658, P= 0.014).

Table 4: Statistical Differences in the Pain Scores Among Different Groups

Pain Scores of Dependent Variables		Mean Difference (I-J)	Std. Error	Sig.
Shot Blocker Group	Manual Group	-1.10938	.28356	.000
	Control Group	-3.17188	.28356	.000
Manual Pressure Group	Shot Blocker Group	1.10938	.28356	.000
	Control Group	-2.06250	.28356	.000
Control Group	Manual Group	2.06250	.28356	.000
	Shot Blocker Group	3.17188	.28356	.000

Table (4) shows that the Shotblocker group had significantly lower pain scores compared to the manual pressure group (mean difference -1.10938) and the control group (mean difference -3.17188). The manual pressure group had significantly higher pain scores compared to the shot blocker group (mean difference 1.10938) and significantly lower pain scores compared to the control group (mean difference -2.06250). Finally, the control group had significantly higher pain scores compared to the Shotblocker group (mean difference 3.17188) and the manual pressure group (mean difference 2.06250).

DISCUSSION

The main aim of study was aims to assess the effectiveness of ShotBlocker and manual pressure applications in minimizing pain related with IM injection in adults. The descriptive statistics of pain levels by using VAS found that two third of the subjects (64.1%) reported no pain after receiving the application in the Shotblocker group Similarly, more than half of participants (54.7%) reported mild pain after receiving the application in the manual pressure group. However, in the control group, two fifth of subjects (43.8%) reported mild pain after receiving the standard IM Injection application (Table 2). The non-pharmacologic pain management approaches may explain that significant difference, using the pain gate control theory pillars. Bilge et al. (2019) founds that the use of certain applications, such as ShotBlocker and cold spray, can potentially reduce the sensation of pain caused by intramuscular injection[33].

Of equal importance, the study findings showed that there is no statistically significant association between pain intensity and patients age group among all groups. Concerning the patient's gender there is no statistically significant association between pain intensity and a patient's gender among all groups (Table 3). These results were expected, because pain could be associated with social, cultural, physical, and cognitive characteristics, However, the incidence of pain resulting from intramuscular injection is directly affected by several directly related factors, including but not limited to: the method of injection, the size of the needle, the injection site, the duration of the injection[61,56,57].

Regarding the fear of IM injection that there is no statistically significant association between pain intensity and fear of IM injection among all groups (Table 3). When the literature is examined, many patients refuse to undergo certain treatments due to their fear of experiencing pain from intramuscular injections. Nurses have a duty to alleviate this fear by identifying methods to reduce pain and maximize comfort during any diagnostic or therapeutic procedures. The primary cause of fear for patients receiving injections is the pain from the needle, and this fear can actually make the pain worse [49]. Abdelkhalek (2019) used the Beck Anxiety Inventory (BAI) between two groups at two injections found no significant decrease in anxiety level. However, the difference between the current study and previous studies does not concern the researcher because the variable of fear of intramuscular injection reflects the attitudes of the person himself/herself and not measured by a scale specific to fear[44].

In current study, the effect of Shotblocker and manual pressure techniques on reducing pain related intramuscular injection were compared. As result of this study, the pain levels were elevated by visual analogies scale (VAS). The researchers found that there are a statistically differences in pain scores among all groups being compared. The ShotBlocker application were found to be effective in reducing the pain levels in patients compared to the manual pressure and control groups. When examined the literature regarding use Shotblocker, limited studies have examined the effectiveness of Shot Blocker in reducing pain levels during intramuscular injection among adult patients. Sahan and Yildiz. (2022) conducted a meta-analysis study revealed that ShotBlocker had a positive effect on reducing pain levels among adult patients receiving IM injections, and to obtain a more comprehensive and effective outcome, further high-quality research that adheres to legal research standards is necessary [37]. In the study by Aydin & Avşar, (2019), which examined the effectiveness of Shotblocker in reducing discomfort brought on by intramuscular injection. A trial found that the Shotblocker was beneficial in minimizing pain related to intramuscular injection[39].

Another trial conducted by Karabey and Karagzolu, (2021) found that the Shotblocker was more effective than Helfer Skin Tap and traditional methods in reducing pain associated with intramuscular injections [58]. Bilge et al. (2019) aimed at evaluating the effectiveness of cold spray and ShotBlocker in reducing intramuscular (IM) injection-related pain in adults, found that ShotBlocker is a non-pharmacological method that is equally effective as cold spray in reducing pain associated with IM injection[33].

As for studies showing that using the ShotBlocker device does not effectively reduce pain during intramuscular injections. One study conducted by Gürdap and Cengiz ,2022 involved (195) adult participants who received diclofenac sodium injections. The trial showed that using cold spray was a more effective method for reducing pain and improving patient satisfaction [45]. Another study by Yilmaz and Alemdar, (2019) focused on non-pharmacological pain management methods for children between 5 to 10 years old who required intramuscular injections in emergency departments. The study involved four subgroups, including the Buzzy group, the ShotBlocker group, the bubble-blowing group, and the control group. The trial demonstrated that using the Buzzy intervention was effective in reducing pain and anxiety for children receiving intramuscular injections[54].

Manual pressure application was found to be effective in reducing the pain levels in patients compared to the control groups, but was a higher pain scores compared to the Shotblocker group. When examined the literature regarding use manual pressure, limited studies have examined the effectiveness of manual pressure in reducing pain levels during intramuscular injection among adult patients. Previous studies have investigated the effectiveness of manual pressure in reducing injection pain in patients are presented here. Bilgiç, (2021) found that the local cold and manual pressure can effectively reduce injection pain in patients [48]. Oztürk et al. (2017) conducted a comparative experimental study that recommended applying manual pressure prior to intramuscular injection in adults to minimize post-injection pain [49]. However, Kant and Akpinar (2017) showed that using a manual pressure device does not effectively reduce pain during intramuscular injections [59].

The non-pharmacologic applications such as (shot blocker, manual pressure) works based on the major pillars of Gate Control Theory. The Melzack and Wall theory, which originated in 1965, is considered a widely regarded as a revolutionary concept in pain management. This theory suggests that the presence and intensity of pain are dependent on the transmission of neurological signals and the mechanisms that control this transmission in the nervous system [40]. By using its blunt points and pressure to apply pressure on the skin and rapidly stimulate small nerve endings. This stimulation temporarily prevents or at least slows pain signals from reaching the Central Nervous System (CNS), which effectively reducing pain during injection. Essentially, the mechanism of action involves closing the gates to the CNS through the use of pressure and nerve stimulation [60].

Based on these results, it was concluded that Shotblocker and manual pressure applications were effective in reducing IM injection related pain. But, the Shotblocker application was more effective compare to the manual pressure application.

CONCLUSION

This study showed that the use of the Shotblocker device was more effective than manual pressure and standard injection procedure in reducing intramuscular injections-related pain scores.

RECOMMENDATIONS

In-service training programs and intramuscular injection protocols should be updated to include the use of non-pharmacological techniques (ShotBlocker) as a tool for controlling pain during administering medication through intramuscular injection. Of equal importance, nurses are advised to utilize non-pharmacological techniques that have been validated as effective more often for alleviating pain caused by intramuscular injections. Additionally, they should remain up-to-date with advancements in this nursing specialty area and apply them in their work. Moreover, it is advisable to assess Shotblocker effectiveness when administering other medications that could potentially cause injection-related pain.

Finally, since pain management is a crucial aspect of nursing, teaching nursing students about the non-pharmacologic techniques, and allowing them to practice these techniques in the clinical setting can be beneficial.

LIMITATIONS

Only the Diclofenac Sodium medication was tested with the current study. Therefore, the results of this study cannot be broadly generalized to other drugs. Due to social traditions, it was difficult to recruit as well as dealing with female subjects, which prompted the researcher to train an emergency nurse to apply the correct method.

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Potential Conflicts of Interest: None

Competing Interest: None

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